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REVISTA DE CIENCIA Y TECNOLOGÍA EN LA CULTURA FÍSICA

Translated from the original in spanish

Original article

Increase in physical capacities balance and gait in elderly with Parkinson

Incremento de las capacidades físicas equilibrio y marcha en adultos mayores con Parkinson

Aumento das habilidades físicas, equilíbrio e marcha em idosos com Parkinson

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ABSTRACT

Restoration of motor faculties is one of the goals of rehabilitation. Through this, it is intended to determine the effectiveness of a physical exercise program in the balance-gait physical capacities of people with Parkinson's, from the specialized area Cienfuegos municipality. In the study, the male sex predominated, the sample n=29, the average age $\bar{x}$=71,7, with standard deviation S=6.9. The study was carried out using a prospective, experimental, pre-experiment with pre-test and post-test design; the distributions of frequencies and percentages of the indicators balance, gait and level of knowledge, evaluated in two moments, were compared. The independence between the variables age, sex and balance-gait and level of knowledge was correlated and evaluated based on looking for relationships in categorical variables of different subtypes. In the same subtypes, Pearson's Chi-square, Gamma and Kendall's Tau b statistics were applied; a normality in the distribution of the data and a p=0.05 is assumed, by means of the statistical program IBM SPSS for Windows version 21.0. Predominance of the male sex prevails, 55% and the ages of 65-74 years, and in the female sex, 75-84 years. The program reflected changes in the dimensions of the different indicators of the variables under study . In conclusion, the program showed significant changes in the physical capacities, balance and gait of elderly with Parkinson and in the level of knowledge of relatives, but there were no dependency relationships between sociodemographic variables and balance-gait.

Keywords. Parkinson's disease; Balance physical capacity; Elderly.

RESUMEN

El restablecimiento de las facultades motrices es uno de los fines de la rehabilitación. Mediante este se pretende determinar la efectividad de un Programa de ejercicios físicos en las capacidades físicas equilibrio-marcha de personas con Parkinson, del área especializada, municipio Cienfuegos. En el estudio, predominó el sexo masculino, la muestra n=29, el promedio de edad $\bar{x}$=71,7, con desviación estándar S=6,9. El estudio se realizó mediante un diseño prospectivo, experimental, preexperimento con pretest y postest; se compararon las distribuciones de frecuencias y porcentajes de los indicadores equilibrio, marcha y nivel de conocimiento, evaluados en dos momentos. Se correlacionó y evaluó la independencia entre las variables edad, sexo y equilibrio-marcha y nivel de conocimientos en función de buscar relaciones en variables categóricas de diferentes subtipos. En los subtipos iguales, fueron aplicados los estadísticos Ji-cuadrado de Pearson, Gamma y Tau b de Kendall; se asume una normalidad en la distribución de los datos y una p=0,05, mediante el programa estadístico IBM SPSS para Windows versión 21.0. Prevalece predominio del sexo masculino, 55 % y las edades de 65-74 años, y en el sexo femenino, 75-84 años. El programa reflejócambios en las dimensiones de los diferentes indicadores de las variables en estudio. En conclusión, el programa evidenció cambios significativos en las capacidades físicas equilibrio y marcha de adultos mayores con Parkinson y en el nivel de conocimiento de familiares, pero no existieron relaciones de dependencia entre las variables sociodemográficas y el equilibrio-marcha.

Palabras clave: Enfermedad de Parkinson; Capacidad física equilibrio; Adulto mayor.

RESUMO

A restauração das capacidades motoras é um dos objectivos da reabilitação. O Objetivo deste estudo era determinar a eficácia de um programa de exercício físico sobre o equilíbrio físico e a capacidade de andar das pessoas com doença de Parkinson na área especializada do município de Cienfuegos. O estudo foi predominantemente masculino, a amostra n=29, a idade média $\bar{x}$=71,7, com desvio padrão S=6,9. O estudo foi conduzido utilizando um desenho prospectivo, experimental, pré-experimental com pré-teste e pós-teste; as distribuições de frequência e percentagens dos indicadores de equilíbrio, marcha e nível de conhecimento, avaliados em dois pontos no tempo, foram comparados. A independência entre as variáveis idade, sexo e equilíbrio-gait e nível de conhecimento foi correlacionada e avaliada a fim de procurar relações em variáveis categóricas de diferentes subtipos. Em subtipos iguais, foram aplicadas as estatísticas Qui-quadrado de Pearson, Gamma e Tau b de Kendall; a normalidade da distribuição de dados e p=0,05 foram assumidos, utilizando o programa estatístico IBM SPSS para Windows versão 21.0. A prevalência era predominantemente masculina, 55%, e a idade de 65-74 anos, e feminina, 75-84 anos. O programa refletiu alterações nas dimensões dos diferentes indicadores das variáveis em estudo. Em conclusão, o programa mostrou mudanças significativas nas capacidades físicas de equilíbrio e marcha em adultos mais velhos com doença de Parkinson e no nível de conhecimento dos membros da família, mas não houve relações de dependência entre as variáveis sociodemográficas e o equilíbrio-gait.

Palavras-chave: Doença de Parkinson; Capacidade de equilíbrio físico; Adulto mais velho.

INTRODUCTION

Within neurological conditions, neurodegenerative diseases stand out; within these, Parkinson's Disease (PD) is one of the most frequent due to its prevalence and incidence worldwide. This condition is among the most studied since its description by James Parkinson in 1817; it was named so several years later by Jean Martin Charco (Tosin, *et al.,* 2016).

PD is a complex neurodegenerative disorder with a wide variety of motor and non-motor symptoms; For its treatment, pharmacotherapy and non-pharmacological interventions are combined (Radder, *et al.*, 2018).

During the interventions aimed at rehabilitating this disease, each researcher defines their objective, but regardless of this, it is suggested to emphasize the linking of components that affect the rehabilitation process. It coincides with Arroyo, Finkel (2013), when they suggest taking into account the physical limitations of the disease that, in all cases, are transferred and affect daily life situations and are focused on the home.

As a consequence of this disease, there is a progressive deterioration of the functional state, reduction of autonomy, affectation of physical capacities, within them the special coordination balance, which makes it impossible to perform tasks of daily life effectively.

Optimal management involves a multidisciplinary approach, the evidence for various non-pharmacological interventions, such as physical therapy, is growing rapidly, however, it is unclear whether combining these monodisciplinary interventions, in a pooled multidisciplinary team approach, offers additional benefits and to what extent cost (Radder, *et al.,* 2018).

Activities with training based on aerobic activity have the potential to improve cognitive and automatic components of motor control, in individuals with mild to moderate disease, through neuroplasticity.

The association between drug treatment and sensory stimuli, focused on motor difficulties, is considered good therapy. Strategies that involve initiation and progression of walking, size of steps withovercoming obstacles, rapid changes in direction and direction, mobility in small spaces and overcoming stressful situations, may modify symptomatic aspects derived from this disorder and be of practical utility.

Pharmacological and surgical treatments do not mitigate the symptoms of the disease, which is why physical exercise has long been proposed as a low-cost alternative without adverse effects (Cardalda, 2021).

Valley, *et al.,* (2012), argue that gait is an activity related to the life of an individual and special interest is given to it because it contributes to providing a vision of well-being to man and constitutes a special form of energy release, emotional compensation and an essential element in bioadaptation.

The deterioration or total or partial loss of motor skills in the individual has a great influence on standing and walking (Valle *et al.,* 2012).

The restoration of the motor faculties is one of the purposes of rehabilitation, as well as the way to retrain walking when it is not functional (Valley *et al.,* 2012; Ayan, *et al.,* (2013); Canning, *et al.,* (2015); Pérez, *et al.,* (2016), focus on the effectiveness of different treatments, based on physical exercise.

Bloem, *et al.,* (2016); Duncan, *et al.,* (2015); Park (2014) and Todd, *et al.,* (2016), coincide in directing the process towards the patient.

Other similar studies (Nadeau, *et al.,* 2014; McNeely, *et al.,* (2015); Shen, *et al.,* (2016); Radder, *et al.,* (2018), focus on precise objectives towards impaired physical motor indicators and ignore motivational and contextual influences, specifically in their family environment. They maintain a marked control over the results in the restoration of physical capacities, important for the functionality of these people, but they neglect a range of influences in their environment of coexistence (family, friends, neighbors, etc.) that can influence, even in aspects engines of his rehabilitation.

On the other hand, Cancela, *et al.,* (2018); Mollinedo, *et al.,* (2021) and Mollinedo (2018) consider that therapies through exercise in people with Parkinson's have positive effects on the development of conditional, coordinative physical abilities (balance, coordination, gait and mood) and improve quality of life of this population.

Gait impairment is a common symptom in PD and is limiting in the autonomy and quality of life of these patients, in addition to being one of the main factors that cause deficit and reduction in the amplitude of the steps and control of their movement frequency.

People with Parkinson's suffer non-motor symptoms, with the consequent impact on their own quality of life and that of people in their social environment (Grazianoa, Rama, 2020, p. 228).

In this regard , it is considered that patients with PD and their families should be advised about the disease. Positive effects on psychological well-being and reduction of interpersonal stress have been shown through interaction with other people with similar experiences. Support groups often offer valuable practical ideas for dealing with specific problems, bringing social and psychological benefits to patients and families.

Arroy, Finkel (2013) delved into the subject and consider that the public authorities must increase the aid and resources available for PD, adopt a global position that does not exclusively contemplate the patient, but their environment, especially the caregivers.

Creating habits in people with the disease enables their contact with others who suffer from the same difficulties, by promoting social relationships, mutual support and providing individual advice to them, family members and caregivers.

The Parkinson's Association, in its program, dedicates several sections to family members and caregivers, with psychological support and mutual help groups for carers. It states that family members play an important role in improving the quality of life of people directly affected by Parkinson's disease, but the lives of family members and caregivers undergo changes and specific stages due to their particular position regarding the problem. For this reason, they also need help to overcome disorders such as: tiredness, exhaustion, stress, insomnia, depression, irritability, etc. Aparkam, (2013).

Obviously, to achieve these conditions in the rehabilitation process, it is necessary to see the patient, the family and the therapist as an entity and in the objectives to involve the context and the factors that surround the patient.

When analyzing this background, the authors of this study set themselves the following objective: to determine the effectiveness of a physical exercise program on the balance-gait physical capacities of people with Parkinson's disease.

The study aims to contribute to greater independence in the activities of daily life of patients in the Specialized Area for people with Parkinson's in the municipality of Cienfuegos, which will facilitate their lives, that of their families and will result in a better quality of life.

The person with the disease will be able to perceive the benefits, will feel more useful and integrated into their family circle, the community and society. He will not be seen as a burden because he will be able to fend for himself; his functions will be lightened, in addition, by being part of the rehabilitation process, values such as: cooperation, mutual help, more open and affective communication that will allow the patient-family-therapist, cope with the consequences of the disease.

The following will benefit: the person with the disease, able to fend for himself; the family, relieved of the *stress* caused by constant attention to a sick person unable to

take care of himself; the community, which will recover one of its members as a socially useful person and, therefore, society.

MATERIALS AND METHODS

The study was carried out using a prospective, experimental design, pre-experiment with pre-test and post-test with a single group. The population consisted of 97 older adults with Parkinson's disease, belonging to the Specialized Area for people with Parkinson's in the Cienfuegos municipality. From this population, a deliberate sample of 30 % was selected: 29 older adults with Parkinson's disease. A relative of each patient was included to determine their level of knowledge about the disease. It was carried out in the period July 2018-July 2019.

To carry out the study, informed consent was obtained from the decision makers who assume responsibility for consulting patients with Parkinson's disease in the Cienfuegos municipality, who were previously notified of their interests, scope of the research, and presented to the investigator.

The informed consent and voluntary collaboration of the patients who attended the consultation in the investigated period and their relatives was requested, they were told that personal data or other information of an individual nature would not be arbitrarily disclosed, the objectives and scope were explained clearly and simply. of the studio.

The individual semi-structured interview was applied relatives related to the process to determine the level of knowledge about the disease. It has 13 *Items* and a total score of 39 points.

Interview interpretation

- Ã 29= High level of knowledge.
- 2820 = Some level of knowledge.
- < 20 = Low level of knowledge.

For the measurement of balance and gait, *The Tinetti Test* was used , consisting of the balance section of nine *items* that give a maximum score of 16 points and the gait section of seven *items* with a maximum score of 12 points. In this way, the total score can vary from 0 a28 points.

To select the indicators of the dependent variables, eight indicators were evaluated, the most deteriorated when applying the Tinetti scale that evaluated 16 indicators: nine balance and seven gait.

Scale Interpretation

The higher the score, the less deterioration of coordination abilities, balance and gait.

- > 24 Without impairment of balance and gait abilities.
- 2419 Moderate impairment of balance and gait abilities.

- < 19 High impairment of balance and gait abilities.

It was applied to the patients for one year, indistinctly, and the following was taken into account: not affecting the usual development of the patients, experienced personnel and recording the data during its performance.

The inclusion criteria of the sample with Parkinson's disease; They were based on different aspects.

- Suffer from similar associated diseases.
- Being in stages 1 and 2 of the disease.
- Not have other physical disabilities.
- Be willing to participate in the study.

The inclusion criteria for the sample of relatives were established according to different elements.

- Attend at least once a week as a patient companion.
- Participate in talks about the disease.
- Be willing to collaborate in the study.

A descriptive analysis of the collected and compared data was carried out according to the distribution of frequencies and percentages of the indicators of balance, gait and level of knowledge, in the two evaluated moments.

Subsequently, the correlation and independence between the variables Age, Sex and Balance-Gait and Level of knowledge were determined by using the Pearson Chi-square correlation statistic, Pearson's R and Spearman's Correlation to search for relationships in categorical variables of different subtypes (ordinal *vs.* nominal) and in the case of the same subtypes (nominal *vs.* nominal), Pearson's Chi-square, Gamma and Kendall's Tau b statistics were applied. Normal data distribution was assumed in all cases and a 95 % confidence level was assumed using the statistical program IBM SPSS for Windows version 21.0.

Structure and characteristics of the Exercise Program

According to Barrios (2009, cited by Fernández 2011), the content must be flexible, adaptable, conciliatory between what the recipient needs and wants and what he is able to assimilate, as well as the knowledge required to be taught. In this sense, requirements could be established when developing the physical exercise program.

Requirements

- The structure of the program must be adjusted to the requirements for the care of older adults with Parkinson's disease and impaired physical capacities.
- The contents, regardless of their characteristics, must contribute to the improvement of the general and special physical condition of the patients.

- The program must be feasible and efficient to apply with few economic and technological resources.
- Attend to the individualized treatment of older adults with Parkinson's disease and advanced deterioration of physical abilities.
- Allow to guide, control and evaluate the process of attention to the deterioration of physical capacities, as well as the dynamics of its execution.
- Create habits in people with the disease, this is made possible by contact with others who suffer from the same difficulties, which fosters social relationships and mutual support.
- Provide individual counseling to people with Parkinson's, family members and carers.

The physical exercise program was based on different criteria:

Epistemological: its design is objectively constituted, based on the results of the diagnosis and the bibliographic review carried out previously, which support the need to develop the program for the orientation, control and evaluation of the components within the process of attention to the deterioration of capacities. characteristics of older adults with Parkinson's disease. For this reason, it contains the theoretical and methodological elements that allow the therapist to scientifically control the process.

Philosophical **:** it is based on the scientific conception of the world, dialectical materialism, when considering the dialectical unit that makes up the biological, psychological and social, that is, the elderly with deterioration of physical capacities and the process of attention to the deterioration of these They are permanently moving towards a process of development. In addition, it is assumed that the world is knowable and, therefore, it is possible to determine the level of progression in patients.

Scientific research: the design took into account the characteristics of the aging process, its consequences and the process of attention to the deterioration of physical capacities of older adults with Parkinson's disease, supported by the theoretical foundation of the research, in which recognized methods are applied and validated in the field of Therapeutic Physical Culture.

Social: it responds to the need arising from the diagnosis made, aimed at solving the problem detected in social praxis, in the context of the PAFC.

Cognitive: The dialectical conception of the Physical Exercises Program is based predominantly on Ausubel's theory, which enjoys substantial practical value in its precision. In this sense, the key lies in guaranteeing this learning.

Since the older adult with Parkinson's disease has a certain functional limitation, which influences his personality, a potentially significant content and a motivated subject must be achieved to establish the relationship between what he learns and what he knows.

Assessment of contemporary approaches to Therapeutic Physical Culture: the program is adjusted to *the medical model* because it places its attention on the activation and strengthening of organic systems from the effects exerted by the practice of systematic physical exercises, it promotes the development of skills and physical capacities

diminished in order to contribute to the increase of the health condition in the studied population.

Based on the above, the program has a prophylactic-therapeutic, educational, instructive and integrative character.

Prophylactic-therapeutic: From the maintenance of residual capacities in this stage of life, it is proposed to prevent possible complications and deterioration in said aging process and, in turn, increase, restore or compensate for lost functions to allow active reintegration into society.

Educational: aimed at the objective formation of convictions and attitudes based on the understanding by older adults with Parkinson's disease of the importance of performing systematic physical exercises, due to the scope that, from the physical, hygienic and social, possess to increase impaired capacities.

Instructive: aimed at achieving the assimilation of content by older adults with impaired physical abilities and form cognitive interests to accelerate the increase of it.

Integrator : given the structured nature of the program and propitiated by the integration of the contents, this allows for a harmonic and general treatment, which contributes to the process. On the other hand, the objective of the program, given its scope, is essential to achieve independence, security and firmness in carrying out activities of daily living.

System of principles that support the preparation and application of the program

The principles are general postulates, derived from the laws that govern education and constitute the foundations for its conduct. From the point of view of the methodological structuring of the proposed program, the general principles of sports training are assumed, adapted for the neurorehabilitation practiced at the International Center for Neurological Restoration, since they are closely related to the different components of the program.

The program is divided into three phases

First phase. Overall conditioning

Listen and ask: it is essential that the patient with Parkinson's disease, due to their psychological characteristics, feel free to tell about their problems and limitations. The following will be established: age, time of evolution of the disease, associated diseases. The characteristics of the disease, the main motor difficulties that may occur and the importance of physical exercise to prevent progression will be explained, as well as the close relationship that must exist between the rehabilitator-patient-family for a greater effectiveness of the Intervention Plan.

- Examine: Based on the information provided, the rehabilitator will examine the patient and apply the scales to assess balance and gait. The patient will be explained what is being done and why.
- Identify the problem: the main motor difficulties are identified to determine what to work on.

- Decide the path: the rehabilitator specifies the actions (Intervention Plan) and always explains to the patient what, how and why it will be carried out.
- Actively incorporate the family into the rehabilitation process and be aware of its importance in this process.
- Positively influence stiffness and hypokinesia to improve joint amplitude and muscle-ligamentous flexibility.
- Improve muscle strength, respiratory function and general endurance of the patient.

Second phase. *Specific conditioning.* It has two moments, the analysis of the evaluation and the selection of specific exercises for the elderly with PD

- Interpret test results and identify original abnormalities.
- Continue the development of the objectives of the previous stage.
- Influence the improvement of postural problems.
- Improve balance and coordination.
- Retrain gait patterns.
- Evaluate the multiple dimensions of balance and mobility.
- Know how the demands of the tasks and the environmental context influence the type of strategy used to maintain or restore balance.

Third phase: *Integration of components*. It has two stages

First stage. Prefunctional

Specific objectives:

- Continue exercising the activities of the previous stage.
- Work on balance and coordination dynamically.
- Train gait patterns with proper posture.
- Exercise the turns and the rhythm of the movements.
- Contribute to the improvement of postural reflexes.
- Work for the elimination of the blocks of the march.

Second stage. Functional

Specific objectives:

- Integrate reeducational elements for utilitarian motor skills.
- Ensure that the patient reaches the best possible capacities to reintegrate into daily social activities.

- Perfect balance, coordination, rhythm, gait and turns.
- Develop a series of exercise progressions designed to improve the voluntary and involuntary use of strategies.
- Manipulate the demands of the tasks or the environment (or both) to ensure the safety of the practices.
- Develop a series of progressions of thought exercises to improve upper and lower body muscle strength.
- Incorporate exercises for strength in the context of balance.
- Develop a series of exercise progressions designed to improve muscle and joint flexibility of the upper and lower body.
- Incorporate flexibility exercises into a balance component.
- Describe the important phases of the gait cycle and the neural mechanisms that control it.
- Identify changes in the gait cycle that are due to aging or pathology.
- Describe the characteristics of the gait of people with different diseases.
- Generate a series of progressive walking activities designed to help older adults with Parkinson's disease develop a more flexible and effective walking pattern.

Balance and coordination activities are carried out aimed at improving control of body movement at different times and static and dynamic gait work is started to facilitate the assimilation of functional gait.

The technical aspects of gait are worked on in different conditions; tasks of daily life are incorporated to facilitate the elderly with Parkinson's, their independence and incorporation into society with the least possible degree of dependency according to their real possibilities. Older adults with Parkinson's who reach this stage must recover the content of strength, coordination and balance necessary to carry out the proposed activities.

RESULTS AND DISCUSSION

The sex-age group relationship showed a predominance of the male sex, 55 % and ages from 65 to 74 years. Within the female sex, 44.8 % and the ages of 75 to 84 years prevailed. Consistent results of a higher prevalence of Parkinson's patients in men compared to women (Tosin, *et al.*, 2016).

The following tables highlight the eight most deteriorated indicators of the Tinetti scale during the pre and posttest (before-after), where changes in its dimensions could be seen (Table 1), (Table 2), (Table 3), (Table 4), (Table 5), (Table 6), (Table 7) and (Table 8).

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Table 1. - Variable Balance. Get up indicator

Get up indicator				
Dimensions	Before		Later	
	F	%	F	%
unable without help	17	58.6	0	0
Able to use arms for support	10	34.5	eleven	37.9
Capable without using arms	two	6.9	18	62.1
Total	29	100.0	29	100.0

Table 2. - Variable Balance. Get Up Attempts Indicator

Get up Attempts Indicator				
Dimensions	Before		Later	
	F	%	F	%
unable without help	twenty	69	0	0
Capable, but needs more than one try	9	31	3	10.3
Able to get up with one try	0	0	26	89.7
Total	29	100.0	29	100.0

Table 3. - Balance Variable. Balance Indicator in Standing

Get up Attempts Indicator				
Dimensions	Before		Later	
	F	%	F	%
unable without help	twenty	69	0	0
Capable, but needs more than one try	9	31	3	10.3
Able to get up with one try	0	0	26	89.7
Total	29	100.0	29	100.0

Table 4. - Balance Variable. Push Test Indicator

Push test				
Dimensions	Before		Later	
	F	%	F	%
Tends to fall	eleven	37.9	0	0
He wobbles, he holds on, but he stands alone	18	62.1	4	13.8
Firm	0	0	25	86.2
Total	29	100.0	29	100.0

Table 5. - Gait Variable. Start of Gait Indicator

Start of the gait				
Dimensions	Before		Later	
	F	%	F	%
Doubts, hesitates or multiple attempts	14	48.3	6	20.7
Not hesitant	fifteen	51.7		79.3
Total	29	100.0	29	100.0

Table 6. - Variable Gait. Indicator Symmetry of the step

Step symmetry				
Dimensions	Before		Later	
	F	%	F	%
Different step length	18	62.1	7	24.1
Equal step length	eleven	37.9	22	75.9
Total	29	100.0	29	100.0

Table 7. - Variable Gait. Indicator Continuity of the steps

Continuity of steps				
Dimensions	Before		Later	
	F	%	F	%
Discontinuity between steps	22	75.9	6	20.7
Continuous steps	7	24.1		79.3
Total	29	100.0	29	100.0

Table 8. - Gait Variable, Gait Posture Indicator

Wolking posture				
Dimensions	Before		Later	
	F	%	F	%
Separate heels	19	65.5	7	24.1
Heels almost touch when walking	10	34.5	22	75.9
Total	29	100.0	29	100.0

Results of the interview with family members during the pre and post-test

During the Pretest, 69 %: 20 relatives manifested *a Low level of knowledge* and 31 %: 9, *Some level of knowledge*, while the Posttest, 86.2 %: 25 relatives manifested a *High level of knowledge* and only 13 %: 4, *certain level of knowledge.*

This result reaffirms what was stated by Jiménez, *et al.*, (2020, p 180) the therapist plays an important role in health promotion, treatment of complications and adaptation to limitations imposed by the disease, which can lead to disability and dependencies.

The family is drastically affected and the caregiver's daily life deteriorates (Abreus, González, & Del Sol, 2016, p.180).

This evidences the importance of establishing patient-family-therapist communication throughout the care process for people suffering from this disease, which leads to an impact on social practice and raises the importance of Therapeutic Physical Culture in the treatment process. promotion of health, concretized in learning for life.

Results of the existing relationships between the sociodemographic variables (Age and Sex) with the variables Balance-Gait and Level of knowledge, during the Pre and Posttest.

Results of the gender and balance-gait variables, during the pre and post-test

These showed that there was no dependency relationship between them, since significance values greater than p>0.05 were obtained in all the applied statistics, at both times of the study, so it was determined that gender did not have any dependency relationship. significant in relation to the Balance-Gait variable at any time during the study. The values obtained in the applied statistics allowed us to accept the null hypothesis that states that the variables analyzed apparently do not have some kind of relationship and to refute the alternative hypothesis that states that the variables apparently have some kind of relationship.

Relationship of the variables age and balance-gait during the pre and post-test

The results in the applied statistics showed that in none of the cases or the moments of the study, the variables Age and Balance-Gait had a dependency relationship, since the significance values obtained are greater than p>0.05, which allowed accept the null hypothesis that apparently the analyzed variables did not have any dependency relationship and refute the alternative hypothesis that states that the variables apparently have some kind of relationship. This relationship was the one that came closest to the established level of significance, yielding p=0.8.

Relationship between the sex-level of knowledge variables during the pre-and post-test

The results of gender showed that the significance values obtained were greater than p>0.05 in all cases and moments of the study, so the null hypothesis was accepted, which states that the variables analyzed do not have any type of relationship, and it was refuted. the alternative hypothesis that states that the variables appear to have some kind of relationship.

Relationship of the variables age-level of knowledge during the pre and post-test

The values recorded in the applied statistics were greater than p>0.05. For this reason, the null hypothesis was accepted, which states that the analyzed variables do not have any type of relationship, and the alternative hypothesis, which states that the variables apparently have some type of relationship, was refuted.

The most widespread studies address motor *deficits* or the deterioration of physical capacities Bleton, & Ziégle, (2012).Dissimilar studies highlight the main therapeutic strategies and works whose efficiency and efficacy provided improvements in quality of life Ayán, *et al.*, (2013); Park, *et al.*, (2014); Allen, *et al.*, (2015); Canning, *et al.*,

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(2015); Duncan, *et al.,* (2015); Pérez, Garcia & Lambek (2016); Bloom, *et al.,* (2016); Todd, *et al.,* (2016); Abreus, González & Del Sol (2016), although no consensus has been reached on the most indicated therapeutic measures to prevent or restore deterioration in physical capacities.

Decline gait capacity is considered one of the disabling symptoms associated with falls and loss of independence. These causes impose the development of therapeutic measures and strategies so that they can overcome said motor disorders, such as: exercises that imply coordination, dexterity, start of the march, quick changes of direction, increase in the distance of the steps, overcoming of obstacles, mobility in confined spaces. The results in this study demonstrate the effectiveness of different treatment techniques, based on physical exercise, in the rehabilitation of PD.

The results between before and after in the different indicators of the Tinetti *test* were significant and showed changes in the different components that control balance, coinciding with Ayán, Cancela & Ríos (2018), Park, *et al.,* (2014), who achieved significant differences in balance capacity, judging by the difference between the initial and final scores on the tests, although its effects on balance were not great. magnitude.

Canning, *et al.,* (2015) concluded that a program of orientation, balance, leg strength, and gait block exercises influences falls in people with *milder disease, but not in those with more severe* Parkinson's disease. Pérez, Garcia, & Lambek (2016) argue that an aquatic Tai Chi training program may be a feasible treatment for pain, balance, and functional capacity in mild and moderate patients, based on the results of their study. Results similar to those obtained in this study.

The results of the *Age and Sex relationships* with the Balance-Gait variables *(Tinetti),* before and after, showed that in none of the cases did the correlation of the measured variables show the existence of a sufficient dependency relationship to argue that, in the sample, the measurements referring to the applied program and the sociodemographic variables studied had statistically high significance.

Only in the case of the relationship of Age with Balance-Gait, after implementing the designed program, is where, for Kendall's Gamma and Tau b statistics, although the values do not support the viability of a relationship hypothesis between the variables, but considering the value obtained (p=0.08), this result could be associated with the size of the sample and influence a dependency relationship between the mentioned variables. The result constitutes a limitation of the study.

To confirm this conjecture, studies with a larger sample selection would be needed, since it is one of the probable causes of the fact that greater dependency relationships between age and improvement in balance-gait after the intervention had not been obtained. in coincidence with the studies by Ferrazzoli, 2018; Todd, *et al.,* (2016).

The results on the level of knowledge of family members play an important role in improving the quality of life of: people directly affected by the disease, family members and caregivers. For this reason, they also need help to overcome different disorders.

CONCLUSIONS

The study concluded that the application of a physical exercise program to elderly with Parkinson's showed significant changes in the balance and gait variables, as well as in the level of knowledge of relatives.

There were no dependency relationships between the sociodemographic variables studied and the balance and gait of elderly with Parkinson's.

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